

Tsunami (soo-NAH-mee)

Tsunamis (Japanese translation “harbor wave”) are waves with a great distance between crests, and are caused by any widespread, sudden movement of large volumes of water. The tsunami grows tall as the ocean shallows, such as in a harbor. In ancient Japan, the people often witnessed the wave rise directly out of the harbor and coined the term tsunami. Tsunamis are most prevalent in the Pacific Ocean, but are known to occur in all ocean basins.

Ten Deadliest Tsunamis

Rank	Deaths	Date	Tsunami Location
1)	226,898	2004	Indian Ocean
2)	50,000	1755	Lisbon, Portugal
3)	36,000	1883	Krakatoa Is., Ind.
4)	31,000	1498	S. Honshu, Japan
5)	27,122	1896	Sanriku, Japan
6)	25,000	1868	Arica, Chile
7)	15,845	2011	Tohoku, Japan
8)	13,486	1771	Ryukyu Trench
9)	8,000	1586	S. Honshu, Japan
10)	5,443	1792	Mt. Unzen, Japan

For more information on historical tsunamis, please see the NOAA/National Geophysical Data Center website at <http://www.ngdc.noaa.gov/hazard/tsu.shtml> .

Tsunami Generation

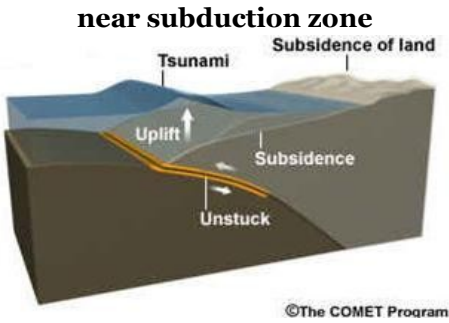
occurs when the sea level is suddenly moved vertically over a wide area. This results in the generation of long wavelength waves, or what we call tsunamis. According to the NOAA National Geophysical Data Center, approximately 80% of all tsunamis are generated by earthquakes. Other sources include volcanoes, landslides, and meteor impacts.

Most earthquake-generated tsunamis are triggered near tectonic plate boundaries where the plates move together. This type of boundary is known as a subduction zone.

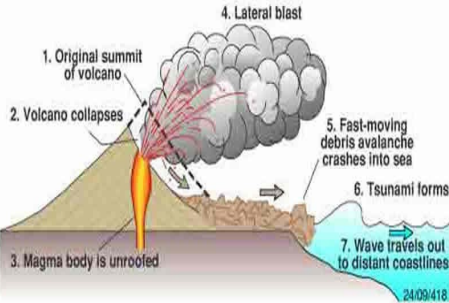
Strong shaking due to earthquakes or volcanic eruptions can trigger landslides which slide into or under the ocean. These landslides, if large enough, can then trigger deadly tsunamis.

For additional interactive information, please visit the tsunami training courses at https://www.meted.ucar.edu/training_detail.php and

Crustal Uplift



Volcano



Tsunami Inundation

occurs when a tsunami covers normally dry land. Inundations are the most dangerous manifestations of a tsunami, and are one of the most costly and deadly coastal hazards that can impact coastal communities in the U.S. A picture of Japan’s March 11, 2011 tsunami inundation and its tide gauge signal (marigram) at Midway Island are shown below.

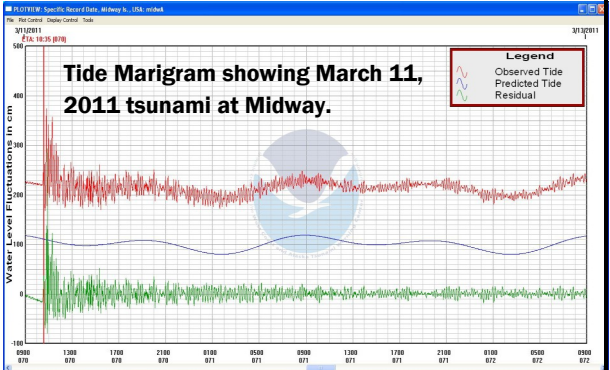


Photo credit: AP

Tsunami Characteristics

A tsunami is a series of traveling ocean waves which are several hundred kilometers in length, five to 60 minutes between crests, and can endanger coastlines for +25 hours. Often generated by large earthquakes in oceanic coastal regions, the rupture displaces the entire water column extending from the sea floor to the surface.

As the tsunami crosses the deep ocean, its length from crest to crest may be a hundred miles or more; height from trough to crest of only a few feet or less. It is not normally noticed aboard ships in deep water, nor seen from the air. Tsunami speed is proportional to water depth; in deep water it exceeds 500 mph.

When a tsunami enters shallow water, its velocity diminishes as wave height increases. It is in these shallow waters that tsunamis become a threat to life and property, for they impact like a fast rising flood striking with devastating force. Rarely, they build up into a vertical wall of water or bore. Associated currents reaching up to 30 knots (26 mph) are one of the most destructive aspects .

Tsunami scientists are making great strides towards wave height prediction. New mathematical models in conjunction with sea level data allow Warning Centers to estimate approximate wave heights prior to arrival, thus assisting coastal communities to prepare.

